1986 GYPSY MOTH INTEGRATED PEST MANAGEMENT PROGRAM ACTIVITIES

CATOCTIN MOUNTAIN PARK
Thurmont, Maryland

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BACKGROUND

The Catoctin Mountains were first settled by Europeans in the mid 1700's. Settlers of German, English and Swiss descent farmed in what is now the western 2/3 of Catoctin Mountain Park. Little or no farming occurred in the eastern third of the park since the soils are sandy, less fertile and drought prone.

The Catoctin Iron Furnace, located 3 kilometers south of the park used charcoal in the smelting process, and the forests of the nearby mountains were soon cut for charcoal production. From the 1770's until about the 1880's most sections of timber were repeatedly cut and processed on outdoor hearths for charcoal. Several sawmills were to be found in this locality and at least 2 nearby mills produced barrel staves into the 1920's.

Early in the 20th century the abundant and economically important American Chestnut (Castanea dentata) was nearly exterminated by an Asian fungal blight. Decreased soil fertility, loss of game, erosion and the decline of several local industries including charcoaling, set the stage for hard times when the Great Depression hit in the 1930's.

Catoctin Recreation Demonstration Area (renamed Catoctin Mountain Park) was created in the heart of Maryland's Catoctin Mountains to demonstrate the wise use of natural resources for park, conservation and recreational purposes. Lands were brought from private owners who were

resettled in the valleys. The forest was allowed to regrow and erosion scars to heal; roads, trails and other visitor facilities were built and wildfire protection instituted. Today after a half century of recovery the forest is starting to appear mature in many sections of the park. Despite regrowth and an aesthetically appealling park that draws over a half million visitors annually, the park staff suspects several natural processes are still disrupted: loss of several "key species" of wildlife; possible suppression of the natural fire regime; and concern over the ultimate composition of the forest canopy since the loss of its most abundant member the American Chestnut.

GEOLOGY

The park is underlain by two main rock types. In the eastern 1/3 of the park, pinkish-white quarzite formations are found, the most resistant of which form such promintories as Wolf Rock, Chimney Rock and the talus field north of Thurmont Vista. The western 2/3 of the park is dominated by a greenish-gray metamorphed lavas called greenstone. Large cliffs of greenstone create natural overlooks such as Hog Rock, and occasional boulder fields. Together, the outcrops, cliffs and talus slopes well illustrate the forces of volcanism, folding, faulting and weathering.

WATER

There are 2 primary streams at the park; Big Hunting Creek and Owens Creek. Both are high gradient streams of excellent water quality. Besides their intrinsic beauty, over 92 taxa of aquatic macroinvertebrate insects have been recorded which support many other

aquatic animals including 2 stocked and 2 species of native trout.

PLANTS

Over 550 species of vascular plants are recorded including 60 species of trees, which occur in several forest types. Eleven taxa of native plants are rare enough in Maryland to be placed on the states Threatened/Endangered List. Many more are uncommon in the middle-Atlantic states or on the edge of their range. About a dozen plants that are not native are particularly persistent or reproducing and are of management concern.

WILDLIFE

The Bison, elk, gray wolf, eastern cougar, porcupine and fisher were extirpated from Maryland in the last century. Bobcat, beaver and black bear still occur in Maryland but do not reside in the park. Over 200 species of birds are thought to occur in the park during some part of the year, including turkeys which started to re-occupy their old habitat in the 1960's. The park is known to be habitat for about 20 reptiles and amphibians, some of which may be considered threatened/endangered in Maryland. Over 200 species of butterflies and moths have been identified so far including the gypsy moth, but little else is known of terrestrial insects in the park.

CULTURAL RESOURCES

The historic resources of the park are not very old in comparison to nearby national historic sites. Historical significance comes from the

efforts of President F. D. Roosevelt to pull the country out of a depression by using government financed labor on public works projects. This labor was used in the construction and development of Catoctin Mountain Park. Many structures from this period remain and may qualify for the National Register of Historic Places. An archeological resources inventory has been proposed for FY85 through FY87. Archeological surveys conducted to date have identified sites that date to at least 1500 B.C.

CAMP DAVID

From the days of President Roosevelt and his original "Shangri-La" to the present-day Camp David, this facility has been the retreat for nine presidents. This area was originally selected in the park because of the proximity to the White House and its isolation. Use of the facilities continues to increase during the successive presidencies. Camp David has hosted a variety of working dignitaries.

Urban encroachment on private lands adjacent to the park, the expansion of Cunningham Falls State Park and increased visitor use of both parks may change Camp David's effectiveness as an isolated retreat. The possibility exists that eventually this facility could revert to the National Park Service as an historic site.

RESEARCH

As a demonstration area, Catoctin Mountain Park has and continues to encourage and facilitate on site research by scientists and naturalists

from Federal, State and private organizations. Some of the recently completed research contracts that relate to gypsy moth are listed on page 16.

SUMMARY OF THE GYPSY MOTH PROGRAM AT CATOCTIN MOUNTAIN PARK

The gypsy moth is no stranger to Catoctin Mountain Park nor are monitoring activities. Prior to 1980, the MDA (Maryland Department of Agriculture) was actively monitoring the insect in central Maryland with male moth traps. These pheromone-baited traps were established on a 2km grid, and positive catches were followed up with egg mass surveys and larval and pupal counts. In 1980, pheromone-impregnated tape (Luretape) was deployed in selected areas of CMP (Catoctin Mountain Park) in order to disrupt mating. Plans were made to deploy luretape on a 10 meter grid throughout CMP in 1981.

The USDA Forest Service, Forest Pest Management staff from Morgantown, West Virginia began working with CMP in 1981 to monitor and manage gypsy moth populations. That year's activities included an egg mass survey in April (report dated May 7, 1981), a defoliation survey in July (report dated July 8, 1981), and concluded with another egg mass survey and a damage potential survey in August (report dated September 29, 1981). The following year (1982) marked the first time an aerial application of insecticide was used on Park Service property to control gypsy moth. A summary of activities from 1982-1986 follows.

1982 Activities

Suppression: Treatment of the entire Park (5769 acres) with a single application of *Bt*. May 13, 14, 17, 1982.

Detection: Defoliation survey. Tree defoliation detected on 42 acres. Results reported July 15, 1982.

Biological Evaluation: Egg mass survey and post-treatment evaluation. Egg mass counts averaged 224 per acre Park-wide. Populations reduced 29 percent compared to pretreatment levels. Results reported October 19, 1982.

1983 Activities

Suppression: Treatment of the entire Park (5769 acres) with a single application of *Bt*. May 19 and 18, 1983.

Detection: Defoliation survey. No tree defoliation detected. Results reported July 27, 1983.

Biological Evaluation: Egg mass survey and post-treatment evaluation. Egg mass counts averaged 27 per acre Park-wide. Populations reduced 88 percent compared to pretreatment levels. Results reported September 27, 1983.

1984 Activities

Suppression: Treatment of 1200 acres of the Park with a single application of Bt. May 24, 1984.

Detection: Defoliation survey. No defoliation observed.

Biological Evaluation: Egg mass survey and post-treatment evaluation. Egg mass counts averaged 84 per acre Park-wide. Results reported December 11, 1984.

1985 Activities

Suppression: Treatment of 673 acres with a single application of Bt. May 6-8, 1985.

Detection: Defoliation survey. No defoliation observed. Results reported August 12, 1985.

Biological Evaluation: Egg mass survey and post-treatment evaluation. Egg mass counts averaged 6 per acre Park-wide. Populations were reduced 93 percent compared to pretreatment levels. Results reported January 13, 1986.

At the end of the 1985 field season, survey data indicated that gypsy moth populations at CMP (6 egg masses per acre) were the lowest since

1980 or earlier. This situation presented an opportunity for CMP to initiate and evaluate tactics to implement a more intensive monitoring program patterned after the Maryland IPM Demonstration Project. The goal of this program would be to more effectively monitor increases in gypsy moth populations, and to evaluate the feasibility of managing the gypsy moth at low levels at CMP. The intensive monitoring/IPM program was initiated in 1986.

INTERVENTION ACTIVITIES--1986

BACKGROUND

Egg mass surveys were conducted in the fall of 1985 in order to evaluate the effectiveness of the Bt applications that spring and to determine the potential for defoliation and the need to treat again in 1986. The results of this survey showed that gypsy moth populations were the lowest that they have been at CMP since 1980 or before. Consequently the USDA Forest Service recommended that treatment was not needed in 1986. Shortly thereafter, an administrative decision was made to treat selected areas of CMP.

SUPPRESSION PROJECT

Approximately 640 acres was treated with one or two applications of Bt in 1986. The treatment area consisted of three (3) distinct blocks (Figure 1). The first, approximately 100 acres, encompassed the entirety of Greentop Campground. This area received a single application of Bt at the rate of 12 BIU in 128oz/acre total formulation. The second and third areas consisted of the Naval Support Facility (Camp David) and the horse trail area behind the facility. Both areas received two (2) applications of Bt, applied at the rate of 12 BIUs in 128oz/acre total formulation. The first application was applied on May 17, 1986. The second application was applied on May 22, 1986. A summary of the suppression project activities is available (Schneeberger 1986).

MONITORING ACTIVITIES--1986

In 1986, the monitoring phase of the IPM program was initiated as planned (Schneeberger et al 1986). This consisted of permanently establishing a 500 meter grid throughout CMP. The grid was set up using a compass and tape measure. At each grid point location a wooden stake, marked with the grid point designation, was driven into the ground and marked with orange paint. A total of 72 grid points was established. All of the population sampling (larval, pupal, male moth, and egg mass) would be initially conducted at these grid points.

LARVAL AND PUPAL SAMPLING

Sampling of larvae and pupae was conducted by banding several candidate trees with a swath of burlap or similar material, servicing the bands at least once a week, and recording all of the larvae and/or pupae seen under the band. In 1986, this sampling phase was initiated before the 500 meter grid system could be established. As a result trees were banded only at four (4) high-use sites at CMP. These were:

1. Greentop Campground
2. Misty Mount Campground
3. Park Headquarters (Camp Peniel)
4. Visitor's Center

The results are presented in Table 1. On a per tree basis, the majority of the larvae and pupae were observed at Misty Mount Campground followed by the Visitor's Center. The least number of larvae and pupae were observed at Greentop Campground.

MALE MOTH TRAPPING

Standard milk carton-type traps baited with the sex attractant disparlure and an insecticide strip were deployed at each grid point in early June. Where possible the traps were secured on the trunk of a primary host tree (oaks). Over the eight week survey period the traps were checked an average of three (3) times each. In many cases the traps were vandalized by small mammals (mainly field mice). Occassionally nests containing young mice were also found in the traps. As a result, it was sometimes difficult to count moths, necessitating estimates based upon the number of wings found.

The cumulative moth catches by grid point are presented in Table 2. Figure 2 shows the grid point locations and the number of moths caught. Every trap deployed caught male moths. Catches ranged from a low of 5 to a high of 1892 moths. Trap catches in the areas treated with Bt last spring were consistently lower than those in the untreated areas. The highest catches were found in the southeastern section of CMP in a predominantly chestnut oak/white oak forest type.

EGG MASS COUNTS

From each grid point center, one-fortieth (1/40) acre fixed-radius plots were established. Within each plot all new egg masses seen on overstory trees, understory trees, brush, shrubs, ground litter, etc. were recorded. The data were then applied to the following formula to produce an egg mass count per acre:

$$Y = 40x$$

where Y = Egg masses per acre

X = Number of new egg masses seen within the plot

The egg mass counts were completed on August 27, 1986, and are presented by grid point in Table 2. Figure 3 shows the grid point locations and the egg mass count at each. Egg mass counts ranged from a low of 40 to a high of 1080 egg masses per acre. Egg masses were found at only 13 grid points or 18 percent of the total. Of those, only 2 contained egg mass counts (520 and 1080 per acre) high enough to cause defoliation in 1987. Six (6) of the 13 grid points are located in the southeastern section of CMP. The remainder are randomly scattered throughout CMP.

DISCUSSION

The primary tasks outlined in the 1986 work plan were accomplished. The grid system was set up and we now have one season of male moth and egg mass data from each grid point. We were not able to collect larvae and pupae at grid points for parasite evaluations because of a delay in hiring field help to set up the grid system. We hope to have people hired by early May so that this monitoring phase can be incorporated in the 1987 IPM program at CMP.

Results of the egg mass survey indicated that the Bt treatments at Greentop Campground, the Naval Support Facility, and the horse trail were successful. It was very difficult to find any egg masses at all in those areas. However, concentration of egg masses including one count of 1080 per acre were found in the southeastern section of CMP. This area is currently being considered for treatment in 1987.

There now exist several areas at CMP where the very low gypsy moth population levels could lend themselves to implementing a non insecticide intervention strategy.

REFERENCES

Schneeberger, N.F. 1986. Summary Report of the 1986 Gypsy Moth Suppression Activities, Naval Support Facility, Thurmont, Maryland. Office Report. August 1986.

Schneeberger, N.F., B.P. Onken, P. Strider, and J. Sherald. 1986. Integrated Pest Management for Gypsy Moth, Catoctin Mountain Park. 1986 Work Plan. Office Report. April 1986.

RESEARCH CONTRACTS COMPLETED AT CATOCTIN MOUNTAIN PARK

1. Annotated Species List of Lepidopteran Insect of Catoctin Mountain Park. Mt. St. Mary's College, Dept. of Science. 1985

2. Susceptibility of Non-target Insects from Impacts of Gypsy Moth Control Program. National Gypsy Moth Management Group, Inc. 1985.

3. Catoctin Mountain Park Bird Study (in relation to Gypsy Moth control). D. Daniel Boone and Barbara A. Dowell. 1986

Table 1.--Average number of Larval and Pupae recorded by site. Catoctin Mountain Park Integrated Pest Management Program. 1986 Activities.

	SAMPLE SITE*			
DATE	GREENTOP CG	MISTY MOUNT CG	PARK HEADQUARTERS	VISITOR'S CENTER
June 5				
# Larvae	0.0	6.6	**	6.2
# Pupae	0.0	0.0	**	0.0
June 12				
# Larvae	0.1	8.4	1.3	7.2
# Pupae	0.0	0.0	0.0	0.0
June 19				
# Larvae	0.5	9.9	2.3	6.5
# Pupae	0.0	1.3	0.5	0.3

*Number of trees banded = 10 at Greentop CG; 7 at Misty Mount CG; 4 at Park Headquarters; and 6 at Visitor's Center

**No sample was collected

Table 2.--Summary of 1986 Male Moth Catches and Egg Mass Counts by Grid Point. Catoctin Mountain Park Integrated Pest Management Program.

Grid Point	# Moths	# Egg Mass Counts (Per Acre)	Grid Point	# Moths	# Egg Mass Counts (Per Acre)
C3	106	0	J4	611	0
C4	247	0	J5	27	0
D2	600	0	J7	339	80
D3	492	120	J8	510	0
D4	315	0	J9	270	0
E2	43	0	J10	437	0
E3	1135	0	J11	988	0
E5	1054	0	K4	1439	0
F1	775	0	K5	1255	0
F2	366	0	K6	1166	0
F3	866	0	K7	871	0
F4	788	80	K8	935	0
F5	5	0	K9	593	0
F8	482	80	K10	523	0
G2	1892	40	K11	1082	0
G3	357	0	L4	892	0
G4	866	40	L5	837	0
G5	876	0	L6	805	0
G7	221	0	L7	1170	40
G8	290	0	L8	931	0
H2	633	0	L9	647	0
H3	429	0	L10	904	0
H4	241	0	L11	310	40
H5	609	0	L12	1857	1080
H7	273	0	M4	1036	0
H8	252	0	M5	798	40
I2	490	0	M6	428	0
I3	825	0	M7	497	0
I4	109	0	M8	454	0
I5	446	0	M9	745	0
I6	128	0	M10	234	0
I8	234	0	M11	1228	80
I9	936	0	M12	1451	120
I10	918	0	N11	1127	40
J2	446	0	N12	1265	0
J3	287	0	N13	1790	520

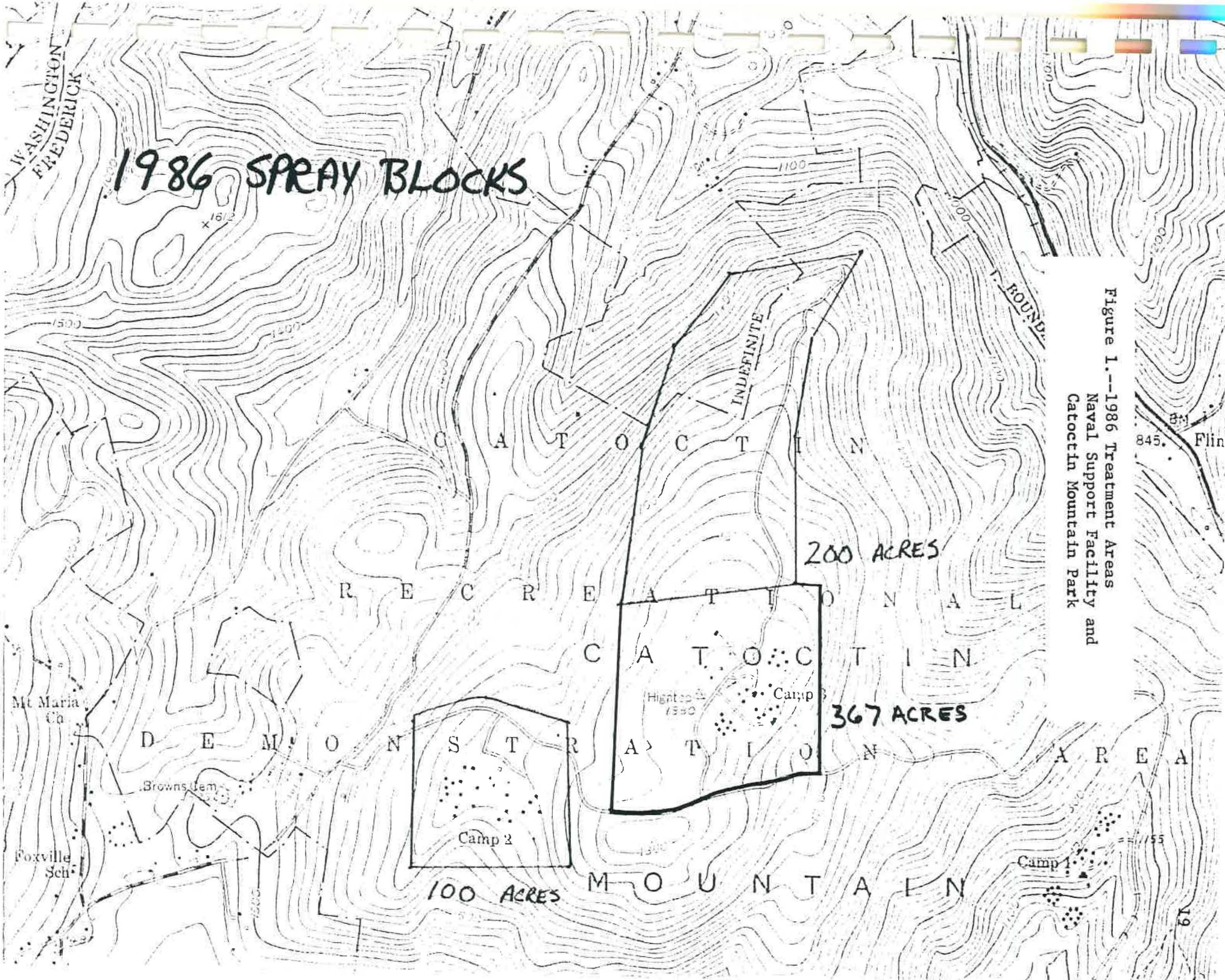

Figure 1.--1986 Treatment Areas
Naval Support Facility and
Catoctin Mountain Park

FIGURE 2.--GRID POINT LOCATIONS AND MALE MOTH CATCHES. CATOCTIN MOUNTAIN PARK IPM PROGRAM, 1986 ACTIVITIES.

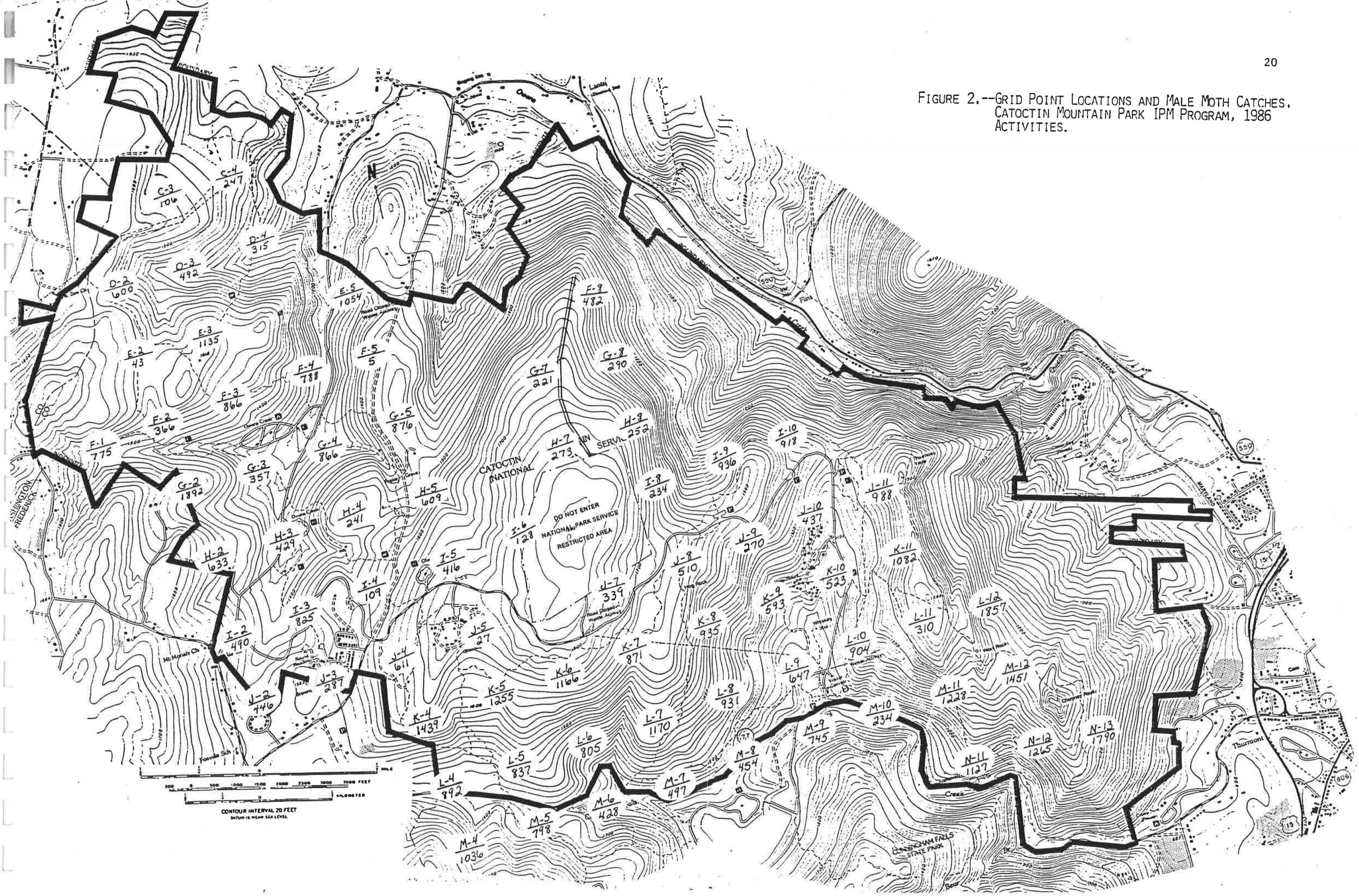

FIGURE 3.--GRID POINT LOCATIONS AND NUMBER OF EGG MASSES PER ACRE. CATOCTIN MOUNTAIN PARK IPM PROGRAM, 1986 ACTIVITIES.